

AMENDMENT UNDER 37 C.F.R. § 1.111

U.S. Appln. No. 09/982,946

Attorney Docket No. Q66881

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions and listings of claims in the application:

LISTING OF CLAIMS:

1. (currently amended): A process for making rare earth doped optical ~~fi~~ber ~~fiber~~ comprising:

using stable dispersions (~~sol~~) of rare earth (RE) coated silica nanoparticles to obtain silica sol; and

applying a thin coating of ~~the~~ said silica sol containing suitable dopants selected from a group consisting of Ge, Al, and P etc.

2. (currently amended): A process for making rare earth doped optical ~~fi~~ber ~~fiber~~, said process comprising ~~steps of~~:

(a) obtaining rare earth (RE) oxide doped silica nanoparticles by sonochemical method;

(b) preparing stable dispersions of ~~the above RE~~ the silica nanoparticles containing powders ~~in the desired proportion~~ in presence of ~~suitable dopants like Al³⁺, Ge⁴⁺ etc.~~ in a silica sol of Si(OC₂H₅)₄ under sonication.;

(c) applying a thin coating of silica sol on ~~the~~ an inner surface of high purity clear fused silica glass tubes by sol-gel dip coating technique;

(d) drying the coated layer in air at 70° to 150°C;

(e) mounting the tube on glass working lathe for processing by MCVD technique;

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(f) dehydrating the coated layer inside the tube at a temperature in the range of 800-1200 °C in presence of excess Cl_2 ;

(g) sintering the coated layer in presence of a mixture of oxygen and helium in the temperature range of 1400 to 1750 °C for formation of ~~the~~ a core;

(h) heating the tube gradually up to a temperature of 1900 °C for further consolidation of the sintered layer;

(i) collapsing the tube by usual method at a temperature in the range of 2000-2300 °C to obtain a preform;

(j) overladding the preform with silica tube, and

(k) drawing ~~fibres~~ fibers of standard dimensions from the preform by the conventional methods.

3. (currently amended): A process as claimed in claim ~~12~~ wherein, the RE oxide is selected from Eu_2O_3 , Nd_2O_3 , Tb_2O_3 and Er_2O_3 ~~for preparation of the silica nanoparticles.~~

4. (currently amended): A process as claimed in claim ~~12~~ wherein, P_2O_5 and F doped synthetic cladding is deposited within a silica glass substrate tube prior to development of the coating ~~by known method like Modified Chemical Vapour Deposition (MCVD) process to~~ obtain matched or depressed clad type structure in the preform.

5. (currently amended): A process as claimed in claim 1 wherein, ~~the~~ a particle size of the RE coated ~~SiO_2 powders~~ silica ranges from 50 to 200 nm.

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6. (currently amended): A process as claimed in claim 1 wherein, the composition in oxide mol% of SiO_2 : Re_2O_3 in ~~Re_2O_3 -coated SiO_2 powders~~ RE coated silica varies from 99.5 : 0.5 to 95 : 5.

7. (original): A process as claimed in claim 1 wherein, the equivalent oxide mol% of SiO_2 in the dispersion varies from 98.5 to 90.5.

8. (currently amended): A process as claimed in claim 1 wherein, a silica sol prepared with $\text{Si}(\text{OC}_2\text{H}_5)_4$ was used as the diluent of the ~~RE_2O_3 -coated silica powder~~ RE coated silica nanoparticles.

9. (currently amended): A process as claimed in claim 1 wherein, the equivalent oxide mol% of ~~GeO_2~~ an oxide of said Ge in the dispersion varies from 1.0 to 5.0 .

10. (currently amended): A process as claimed in claim 1 wherein, Ge^{4+} was added ~~through~~ using $\text{Ge}(\text{OC}_2\text{H}_5)_4$ in the silica sol.

11. (currently amended): A process as claimed in claim 1 wherein, the equivalent oxide mol% of ~~Al_2O_3~~ an oxide of said Al in the dispersion ranges from 0.5 to 4.0.

12. (currently amended): A process as claimed in claim 1 wherein, Al_2O_3 is provided to the solvent in the form of aluminium salts ~~such as chlorides, nitrates or any other salt soluble in the solvent~~.

13. (currently amended): A process as claimed in claim 1 wherein, ~~the~~ a solution of a salt of said Al ~~aluminium salt~~ is prepared using a solvent selected from alcohol and water.

14. (currently amended): A process as claimed in claim ~~13~~ wherein, the oxide mol% of Er_2O_3 in the dispersion ranges from 0.01 to 0.60.

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15. (currently amended): A process as claimed in claim 1 wherein, hydrochloric acid or nitric acid is ~~strong mineral acids~~ used for preparing the sol for dispersion ~~are selected from hydrochloric or nitric acid.~~

16. (currently amended): A process as claimed in claim ~~1~~ 13 wherein, the alcohol selected is soluble in the dispersion system.

17. (currently amended): A process as claimed in claim ~~1~~ 16 wherein, the alcohol is selected from the group ~~comprising~~ consisting of methyl alcohol, ethyl alcohol, propan-1-ol, propan-2-ol, butan-1-ol and butan-2-ol.

18. (original): A process as claimed in claim 1 wherein, pH of the dispersion ranges from 1 to 5.

19. (original): A process as claimed in claim 1 wherein, viscosity of the dispersion varies from 1 to 10 mPa s.

20. (currently amended): A process as claimed in claim 1 wherein, a sonication time of the dispersion ranges from 30 to 200 minutes.

21. (currently amended): A process as claimed in claim 1 wherein, a settling time of the dispersion varies from 1 to 10 hours.

22. (currently amended): A process as claimed in claim ~~1~~ 2 wherein, a lifting speed of the tube from the dispersion ranges from 4 to 15 cm/minutes.

23. (currently amended): A process as claimed in claim ~~1~~ 2 wherein, a baking temperature of the coated tube varies from 70° to 150°C.

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24. (currently amended): A process as claimed in claim ~~1~~ wherein, a baking time of the coated tube ranges from 0.5 to 5 hours.

25. (currently amended): A process as claimed in claim ~~21~~ wherein, the core composition is selected from the group ~~comprising~~ consisting of $\text{RE}_2\text{O}_3 + \text{SiO}_2 + \text{GeO}_2$, $\text{RE}_2\text{O}_3 + \text{SiO}_2 + \text{GeO}_2 + \text{Al}_2\text{O}_3$, $\text{RE}_2\text{O}_3 + \text{SiO}_2 + \text{GeO}_2 + \text{Al}_2\text{O}_3 + \text{P}_2\text{O}_5$ and $\text{RE}_2\text{O}_3 + \text{SiO}_2 + \text{GeO}_2 + \text{P}_2\text{O}_5$.

26. (currently amended): A process as claimed in claim ~~21~~ wherein, ~~the~~ a temperature of the RE oxide containing core layer is increased in steps of 50 to 200 °C during the sintering depending on ~~the~~ a composition and Al/RE concentration of the core ~~layer~~.

27. (currently amended): A process as claimed in claim ~~1~~ 2 wherein, the mixture of O_2 and He is in the range of 3:1 to 9:1 during sintering.

28. (currently amended): A process as claimed in claim ~~1~~ 2 wherein, source of chlorine is CCl_4 where helium is used as carrier gas.

29. (currently amended): A process as claimed in claim ~~1~~ 2 wherein, ~~the~~ a proportion of Cl_2 : O_2 during drying varies from 1.5 : 1 to 3.5 : 1.

30. (currently amended): A process as claimed in claim ~~1~~ 2 wherein, ~~the~~ a dehydration period lies between 1 to 2 hours.

31. (currently amended): A process as claimed in claim ~~1~~ 2 wherein, the core ~~layer~~ is sintered in the presence of germania ~~to facilitate germania incorporation and to obtain appropriate numerical aperture value.~~

32. (currently amended): A process as claimed in claim ~~1~~ 2 wherein, germania is supplied to the core ~~layer~~ during sintering by including GeCl_4 with the ~~input~~ oxygen.

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33. (currently amended): A process as claimed in claim ~~1~~2 wherein, the sintering is carried out at a temperature of 1200 °C to 1400 °C.

34. (currently amended): A process as claimed in claim ~~1~~2 wherein, ~~depending on the composition of the core,~~ POCl₃ is added to the input gas mixture during sintering.

35. (currently amended): A process as claimed in claim ~~1~~2 wherein, the core ~~layer~~ is doped with P₂O₅ to ~~facilitate RE incorporation.~~

36. (currently amended): A process as claimed in claim ~~1~~ wherein, P₂O₅ and GeO₂ concentrations vary from 0.5 to 5.0 mol% and 3.0 to 25.0 mol% respectively in the RE doped core ~~layer.~~

37. (currently amended): A process as claimed in claim ~~1~~2 wherein, the numerical aperture of the fibre is varied from 0.10 to 0.30.

38. (currently amended): A process as claimed in claim ~~1~~2 wherein, RE concentration in the core is maintained in the range of 50 to 4000 ppm ~~to produce fibres suitable for application as amplifiers, fibre lasers and sensors or different purposes.~~

39. (currently amended): A process as claimed in claim ~~1~~2 wherein, codopants ~~like Al and other rare earths~~ are added to the core ~~doped with a selected RE to fabricate fibres containing various dopants in the core~~ in the concentration range 50 to 5000 ppm and numerical aperture varying between 0.10 and 0.30.

40.-42. (deleted)

43. (currently amended): A process as claimed in claim 1 wherein, the rare-earth oxide coated silica nanoparticles are dispersed at ambient temperature in the silica sol ~~mentioned~~

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~~above under sonication thereby eliminating the possibility of formation of the microcrystallites and clusters of rare earth ions as in the conventional techniques.~~

44.-52. (deleted)